Available online at www.sciencedirect.com

Borsa İstanbul Review

Borsa İstanbul Review 14-3 (2014) 133–144
http://www.elsevier.com/journals/borsa-istanbul-review/2214-8450

Review

The role of Foreign Direct Investment (FDI) in a dualistic growth framework: A smooth coefficient semi-parametric approach

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Received 19 June 2014; accepted 28 June 2014
Available online 8 August 2014

Abstract

This paper examines the relationship between Foreign Direct Investment (FDI) and economic growth. We extend the dualistic growth framework by Feder (1982), whereby we divide the economy into an exports and a non-exports sector and assume that the FDI is mainly entering the former. In order to empirically estimate the effects of FDI on economic growth, we employ a smooth coefficient semi-parametric approach. Our results show that countries with higher levels of FDI inflows experience higher productivity in the exports sector as compared with those with low level of FDI inflows. In general, we provide some evidence that FDI inflows play an important role during the development process: Initially, as an important determinant of growth, later on, by helping improve factor productivity in the exports sector and finally, through spillover effects due to fostering the linkages between the Multinational Corporations (MNC) and their host economy partners.

JELCode: O47; F10; F21

Keywords: FDI; Dualistic growth model; Spillovers; Productivity; Smooth coefficient

1. Introduction

The role of Foreign Direct Investment (FDI) in economic development has been the subject of long debate. Many policy makers and academics have argued that FDI can have a positive impact on the development efforts of the host country and as such, developing countries should encourage FDI as a means of promoting economic growth. Central to the argument in support of FDI is that in addition to the direct capital financing, it can also be a source of valuable technology and know-how transfer while fostering linkages with foreign entrants and their host economy partners. According to this line of argument FDI is considered to be a vehicle through which new ideas, advanced techniques, technology and skills are transferred across borders and provide substantial spillover effects. Yet, according to the results coming from a wide range of studies on almost every aspects of the FDI and growth nexus, FDI is not performing as expected. The evidence is ambiguous with a wide range of contradictory empirical results. For example, firm-level studies in given countries often find that FDI does not boost economic growth with minimal, if any, positive spillover effects (Aitken and Harisson, 1999; Haddad and Harisson, 1993). However, macroeconomic studies using aggregate FDI flows and a broad cross-section of countries often find a positive role of FDI in generating economic growth (Bende-Nabende and Ford 1998; Borensztein et al., 1998; De Gregorio, 1992).

As a result, determining the exact impact of FDI on economic growth in developing countries has proven to be empirically elusive. In this regard theory also provides conflicting predictions. On the one hand, for example Romer

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Peer review under responsibility of Borsa İstanbul Anonim Şirketi.

http://dx.doi.org/10.1016/j.bir.2014.06.004

(1993) argued that there exists an "ideas gap" between rich and poor countries. In this regard, foreign investment can ease the transfer of technology and business know-how to poorer countries. According to this view, FDI may boost the productivity of all firms not only those receiving the foreign capital and that implies that the transfer of technology through FDI will have substantial spillover effects for the entire economy. On the other hand, some theories predict that FDI in the presence of preexisting distortionary economic policies will hurt resource allocation and slow down economic growth (see for example Boyd and Smith (1992)).

An important issue which has been raised recently regarding FDI-growth nexus is the increasing interest of developing countries to use exports as a platform for FDI. The idea behind the export platform FDI also known as "EPFDI" is that the Multinational Corporations (MNCs) and their foreign affiliates prefer to invest in the export oriented industries in the host countries and as such the local market in the host country is of no significance to the MNC's location decision. That is why EPFDI is observed in countries that view their economic growth as being "export-led". These are the economies that seek access to international technology and have small domestic markets. The consequence is that countries that systematically promote EPFDI will create a type of dualism in their economies with little interdependence between MNCs and local enterprises. One of the interpretations of this type of dualism is the differences in the type of industries in which MNCs and local enterprises are active. For example, MNCs might operate in high-tech industries whereas the local enterprises are active in the traditional ones.

In order to study the EPFDI phenomenon in this paper we make use of the dualistic growth model developed by Feder (1982). The idea is that the overall economy is divided into an exports and a non-exports sector under the assumption that the exports sector introduces external effects on the rest of the economy. The main advantage of Feder's model is that it allows for separate measures of sector externality effects and factor productivity effects between the two sectors respectively. As a result we will be able to estimate the indirect effects of FDI on economic growth in developing countries, something that to our knowledge has not been studied before. Using the definition of EPFDI in this paper we assume that the FDI inflows are coming to the exports sector, mainly because of higher factor productivity in that sector. The intuition is that at the early stages of development capital intensive investment is mainly coming to the more productive industries (exports) and as the economy develops the technological demands of the more developed capital-intensive sector will lift the productivity of other sectors (non-exports) as well. Further, in order to capture the indirect effects of FDI on economic growth we assume that the external effects of the exports sector are a function of FDI inflows in the host country. It has been discussed in the literature that there are several ways FDI from MNCs can generate positive production externalities and improve the productivity of domestic enterprises. For example the presence of foreign affiliates in the economy: (i) can force the domestic enterprise to improve their productivity; (ii) may lead to the diffusion of new technology and the production process to the local enterprises; and (iii) can enhance the development of local enterprises through creating backward and forward linkages. In other words we can say that exports along with FDI are the main channels through which the diffusion of technology from advanced countries to the developing countries will take place (See Barro (1999) for review).

Previous studies have mentioned two main channels through which FDI can enhance the overall growth of the host country. Firstly, FDI can encourage the adoption of new technology in the production process through capital spillovers and secondly, FDI may stimulate knowledge transfers, both in terms of labor training and skill acquisition, and by introducing alternative management practices and better organizational arrangements. Therefore, by using exports as a platform for FDI developing countries can benefit in two ways. Firstly, by gaining higher productivity in the exports sector which in-turn increases the aggregate output through an increase in demand for the country's output via exports. Secondly, through the spillover effects of FDI, a mechanism through which FDI generates positive externalities and improves the productivity of domestic enterprises. It is therefore not surprising that the attitude towards the inward FDI is considerably changed over the past decades. Most of the countries have liberalized their policies to attract all kinds of foreign direct investment. As we mentioned earlier, the indirect impacts of FDI on economic growth of the host country deserves more careful examination. This impact is essentially twofold: Firstly, by encouraging the incorporation of new inputs and foreign technologies in the production process of the recipient country. Secondly, by augmenting the existing stock of knowledge in the host country through labor training and skill acquisition on the one hand, and through the introduction of alternative management practices and organizational arrangements, on the other. Therefore, in the light of above discussion we can say that the investment through MNCs and their foreign affiliates can potentially increase the productivity of the host country and in this regard FDI is considered as a catalyst for domestic investment and technological progress.

As it was mentioned above, empirically the results appear ambiguous (Carcovic and Levine, 2002; Durham, 2004). One of the reasons behind the lack of strong empirical support for the role of FDI in promoting economic growth is likely the presence of heterogeneity that manifests empirically as nonlinearity in the FDI and growth relationship. Most of the previous studies either use a linear empirical growth model specification or try to bypass the nonlinearity issue by using ad hoc procedures such as adding quadratic or interaction terms in linear regressions.[1] Given the fact that growth theory provides little guidance about functional forms it is almost impossible to pinpoint the exact form of nonlinear

[1] An exception is Kottaridi and Stengos (2010) in the context of an extended Solow type framework. They use similar semiparametric techniques, but a different theoretical framework from what we do here to assess the presence of nonlinear effects in the FDI growth nexus.

specification that would be appropriate for all data sets and for all data ranges. Therefore, in this paper, unlike most previous studies we do not superimpose any ad hoc functional form on the FDI-growth relationship and our empirical analysis is free from any possible functional form misspecification bias.

This paper contributes to the existing literature in two ways. Firstly, we relax the linearity constraint in examining the role of FDI on economic growth by utilizing a smooth coefficient semiparametric model. This model allows economic growth to respond to determinants differently in different countries, something that will manifest in a non-linear relationship. Secondly, we will be able to identify the indirect effect of FDI on economic growth.[2] The remainder of the paper is organized in the following manner: A brief review of literature is presented in the next section. In Section 3 we present the theoretical framework of our analysis. Section 4 briefly describes the econometric methodology that we employ, while the data set and empirical results are discussed in section 5. Section 6 concludes. Some technical details regarding estimation and testing of the model are presented in Appendix A, whereas the full list of countries in our data set is included in Appendix B.

2. Literature review

The empirical literature on the relationship between FDI and economic growth has grown enormously over the last few years. Due to the nature of this research we divide the literature into two broad categories.

2.1. Studies examining the direct effects of FDI

The authors in this group of studies generally argue that FDI should be considered as a major channel through which developing countries can get access to advanced technologies and enhance their economic growth. The first study in this group is Findlay (1978), where the author found that FDI increases the rate of technical progress in host countries through the diffusion of more advanced technology, management practices etc. Wang (1990) used the neoclassical growth framework and showed that FDI can increase the knowledge applied to the production process in host countries. Bende-Nabende and Ford (1998) conducted a time series study for Taiwan and found a positive and significant impact of FDI on output. More recently, Carcovic and Levine (2002) used the data from 72 countries over the period of 1960–1995, but found no growth enhancing effects of FDI. Similarly, Durham (2004) used the data for 80 countries from 1979 to 1998 and found that FDI does not have any positive impact on economic growth.

There are some other researchers in this group who tried to measure the impact of FDI on growth conditioned on some economic or structural characteristics of the host country. For example Blomström et al. (1992) used data for 78 developing countries from 1960 to 1985 and found a positive correlation between FDI and growth. Furthermore, they concluded that this impact is larger in countries with higher income levels. Balasubramnyan et al. (1996) examined 46 developing countries for the period of 1970–1985 and concluded that FDI is growth enhancing only for outward oriented countries. Borensztein et al. (1998) used data from 69 developing countries to measure the impact of FDI on economic growth and found that FDI is growth enhancing only in countries with higher level of human capital. Xu (1999) used the US FDI data for 40 countries (20 developed and 20 developing) and concluded that FDI contributes to the productivity growth only in developed countries but not in developing countries. Further, he concluded that this insignificant impact of FDI in developing countries is mainly due to the absence of adequate capital in these countries for example Alfaro et al. (2003) found FDI is growth enhancing only in countries with developed financial markets.

2.2. Studies examining the spillover effects of FDI

The earliest discussions of spillovers in the literature on FDI date back to the 1960s. The first author to systematically include spillovers (or external effects) among the possible consequences of FDI is MacDougall (1960), who analyzed the general welfare effects of foreign investment. Another early contributor was Corden (1967), who looked at the effects of FDI on optimum tariff policy.

Most of the studies in this group conducted sectorial, enterprise, or firm level analysis to examine the spillover effects of FDI. For example Katz (1969) examined the impact of FDI inflows in the Argentine manufacturing sector and found a significant positive spillover effects on the technological progress of local enterprises. Similarly, Aitken and Harrison (1991) used data from Venezuelan manufacturing sector and found that forward linkages generally brought positive spillover effects whereas, the backward linkages appeared to be less beneficial because of the foreign firms' high import propensities. Sjöholm (1999a, 1999b) conducted a study for the Indonesian manufacturing industry and found that the geographical dimension is important for generating positive inter-industry spillover effects. Some recent studies also claimed that inward FDI through its spillover effects made important and significant contribution to the economic growth in host countries. For instance, Liu et al. (2000), Driffield (2001), and Pain (2001) all found statistically significant spillovers in the UK, as do Lipsey and Sjöholm (2001), and Dimelis and Louri (2002) in their studies for Indonesia and Greece, respectively.

On the other hand, there are several studies that found negative spillover effects of the presence of MNCs on domestic firms. For example Aitken and Harrison (1999) found that entry of the MNCs and their foreign affiliates disturbed the existing market equilibrium in the host countries and forced the domestic enterprises to reduce their output and hence lower their productivity due to the decline in their scale

[2] Zhang and Felmingham (2002), and Sun and Parikh (2001) are the only studies we found that utilize the Feder model to evaluate the impact of FDI on economic growth in different provinces of China. However, both of these studies used the linear regression approaches.

of production. Perez (1998) investigated the increase in competition caused by the entry of US multinationals into European markets between 1955 and 1975 and found that positive technology spillovers did not occur in all industries. Similarly, Blomström et al. (1994) argued that positive FDI spillovers are less likely in countries/industries in which the gap between the technologies of domestic and foreign enterprises is large and the absorptive capacity of the local enterprises is low.

So far the results on the presence of spillover effects of FDI are mixed. Görg and Strobl (2001) conducted a meta-survey of the spillover literature and concluded that the results are based on whether time-series or cross-sectional data had been used with the former finding positive spillovers and the later often negative. Lipsey (2003) stated that "the evidence for positive spillovers is not strong". According to him, it is safe to conclude that the evidence regarding the spillover effects of FDI is mixed and there is no universal relationship exists.

3. The dualistic growth model

The theoretical model that we use is an extended version of Feder's (1982) model. In that paper Feder proposed a growth model for the developing countries that recognized the importance of dualism, in his case, technology differences between sectors, an exports and a non-exports sectors. The exports sector is assumed to be more productive then the non-exports sector and it produces external effects on the rest of the economy. Our main contribution is to extend Feder's (1982) model by augmenting it with foreign direct investment. The assumption we make is that due to the higher factor productivity levels foreign investors find investment in the exports sector more attractive. Hence, FDI inflows are mainly coming to the exports sector of the economy. As we already discussed this point in the introduction there is an increasing trend in developing countries to use exports as a platform for foreign investment, the so called EPFDI strategy. In this context we are providing a systematic framework for testing the EPFDI hypotheses formally and to our knowledge this has not been tested before in this literature. We start with the disaggregation of total investment in the exports sector into foreign and domestic investment. The model can be described as follows. Let Y = total output of the economy (GDP), N = output of the non-exports sector, and output of the exports sector. Then;

$$Y = N + X \tag{1}$$

The production functions of the two sectors given in equations are given as follows.

$$N = F\left(K_N^d, L_N, X\right) \tag{2}$$

$$X = G\left(K_X^d, K_X^f, L_X\right) \tag{3}$$

where K_X^d and K_N^d are the domestic capital stock in the exports and non-exports sectors respectively and K_X^f is the foreign capital stock in exports sector. The assumption here is that the foreign capital is only included in the exports production function, whereas the domestic capital and labor are distributed across both sectors. This will lead us to the following definitional identities

$$K = K_N^d + K_X^d \tag{4}$$

$$L = L_N + L_X \tag{5}$$

Let G_K^d and G_K^f represent the marginal products of domestic and foreign capital in the exports sector respectively, then.

$$\dot{Y} = F_K^d \dot{K_N^d} + F_L \dot{L_N} + F_X \dot{X} + G_K^d \dot{K_X^d} + G_K^f \dot{K_X^f} + G_L \dot{L_X} \tag{6}$$

where "." denotes change over time. Further we assume that $G_K^f / G_K^d = \lambda > 1$ in addition to the basic assumption of higher marginal productivity in the exports sector $G_K^d / F_K^d = G_L / F_L = (1+\delta)$. The intuition is that FDI by MNCs is considered to be a major channel through which developing countries can get access to advanced technologies. Since, MNCs account for a substantial part of the world's R&D investment, FDI coming to the exports sector will also introduce some new technologies and this will translate into higher productivity of foreign capital as compared with domestic capital in that sector.

We proceed to substitute $G_K^d = (1+\delta)F_K^d$, $G_L = (1+\delta)F_L$ in equation (6) and after some manipulations we get.

$$\dot{Y} = F_K \dot{K} + F_L \dot{L} + \frac{G_K^f}{(1+\delta)} \dot{K_X^f} + \left[\frac{\delta}{(1+\delta)} + F_X\right] \dot{X} \tag{7}$$

Re-writing the above equation into rate of change form we obtain.

$$\frac{\dot{Y}}{Y} = F_K \frac{K}{Y}\frac{\dot{K}}{K} + F_L \frac{L}{Y}\frac{\dot{L}}{L} + \frac{G_K^f}{(1+\delta)}\frac{\dot{K_X^f}}{Y} + \left[\frac{\delta}{(1+\delta)} + F_X\right]\frac{\dot{X}}{Y} \tag{8}$$

Considering the relationship between the marginal productivity of foreign and domestic capitals in the exports sector we have the following expression $G_K^f = \lambda(1+\delta)F_K$. Substituting this expression in equation (8) we get the following reduced form equation.

$$\frac{\dot{Y}}{Y} = \alpha \frac{\dot{K}}{K} + \beta \frac{\dot{L}}{L} + \zeta \frac{\dot{K_X^f}}{Y} + \gamma \frac{\dot{X}}{Y} \tag{9}$$

where $\zeta = \lambda F_K$ and $\gamma = [\delta/(1+\delta) + F_X]$.[3] Further, in order to specify the sectorial externality effect separately we assume as in Feder (1982) that the exports sector affects the production of non-exports sector by some parameter θ. However, unlike the basic model we also assume that this parameter θ is not constant but also a function of FDI inflows in the host country. This can be expressed as

$$N = F(K_N, L_N, X) = X^{\theta(Z)} \Psi(K_N, L_N) \tag{10}$$

[3] The simple version of the model developed by Feder (1982) would result in an alternative reduced form equation given by $\frac{\dot{Y}}{Y} = \alpha\frac{\dot{K}}{K} + \beta\frac{\dot{L}}{L} + \gamma\frac{\dot{X}}{Y}$.

where Z is the level of FDI inflows and is considered as exogenous. Differentiating the above expression with respect to X we get $\frac{\partial N}{\partial X} = F_X = \theta(Z)\frac{N}{X}$.[4] After some additional algebra we obtain the second reduced form equation

$$\frac{\dot{Y}}{Y} = \alpha\frac{\dot{K}}{K} + \beta\frac{\dot{L}}{L} + \zeta\frac{\dot{K}_X^f}{Y} + \left[\frac{\delta}{(1+\delta)} - \theta(Z)\right]\frac{\dot{X}}{Y} + \theta(Z)\frac{\dot{X}}{X} \tag{11}$$

The final term in the above equation captures the indirect effect of FDI on economic growth in the host country. As mentioned earlier in the literature, investments from MNCs generate important positive externalities or spillovers that enhance the productivity of domestic enterprises in the host economy. We can model this as a general unknown function $\phi(.)$. Equation (11) can also be written as.

$$\frac{\dot{Y}}{Y} = \alpha\frac{\dot{K}}{K} + \beta\frac{\dot{L}}{L} + \zeta\frac{\dot{K}_X^f}{Y} + \left[\frac{\dot{X}}{Y}\right]\omega(.) + \frac{\dot{X}}{X}\phi(.) \tag{12}$$

where $\omega(.) = \left[\frac{\delta}{(1+\delta)} - \theta(Z)\right]$ and $\phi(.) = \theta(Z)$.[5] The central importance of our paper is to be found in equation (12) that allows us to measure the direct as well as indirect affects of FDI on economic growth. We estimate the above equation using a semiparametric smooth coefficient approach, the description of which is provided in the next section.

4. Econometric framework

The central issue in equation (12) of the previous section is the estimation of the functions $\omega(.)$ and $\phi(.)$. The estimation approach adopted in this paper is the smooth coefficient semi-parametric approach (see Cai et al., 2006; Fan, 1992; Fan and Zhang, 1999; Ketteni, Mamuneas, & Stengos, 2007; Kourtellos, 2003; Li et al., 2002; Mamuneas et al., 2006). It is a generalization of varying coefficient models and uses the local polynomial linear regression of Stone (1977) and Fan (1992), along with the widely used Nadaraya-Watson constant kernels.

The general description of the method is as follows. The observed sample is given as: $\{Y_i, V_i, X_i, Z_i\}, i = 1, \ldots.., n$, a realization from an *i.i.d.* random vector $\{Y, V, X, Z\}$ (for notational simplicity we suppress the observation subscript $i = 1, \ldots.., n$ with $n = N \times T$). We let Y to denote real GDP growth and let Z be net per capita FDI inflows. We also denote by $V = \left\{\frac{\dot{K}}{K}, \frac{\dot{L}}{L}, \frac{\dot{K}_X^f}{Y}\right\}$ and $W = \left\{\frac{\dot{X}}{Y}, \frac{\dot{X}}{X}\right\}$ and appending an error term equation (12) can be re-written in matrix form as

$$Y = V\beta + W\Omega(Z) + u \tag{13}$$

where $\Omega(Z) = [\omega(Z), \phi(Z)]'$ and the error term u satisfies the standard orthogonality condition $E(u|V, X, Z) = 0$.

The presence of a linear part in above equation makes this model more general than the smooth coefficient model of Fan and Zhang (1999). Following Mamuneas et al. (2006) we use a two-step procedure to estimate equation (13). In the first-step the variables of the linear part are projected off the other variables to produce the new redefined variables in equation (14) below and return to the simple smooth coefficient environment of Fan and Zhang (1999) and Li et al. (2002), see the appendix for more details on the approach used.

$$Y^* = W^*\Omega(Z) + u^* \tag{14}$$

where Y^* and u^* denote the redefined dependent variable and the error term respectively.

The coefficients $\omega(Z)$ and $\phi(Z)$ are evaluated at a particular value of Z, say z, is a smooth but unknown function of z. One can estimate the smooth coefficients parameters $\omega(z)$ and $\phi(z)$ using the local least square approach, see Fan and Zhang (1999), Li et al. (2002) for details. Once we estimate the smooth coefficients given by $\Omega(Z)$, we can then proceed to redefine the dependent variable once again and run a linear regression to obtain the estimates of β in equation (13) above. In Appendix A we present a more extensive discussion of estimation and testing details regarding the smooth coeffcient regression model.

5. Data and empirical results

5.1. Data

The data used in this study come from two main sources. The FDI data is obtained from the United Nations Cooperation on Trade and Development (UNCTAD) data set. The FDI data comprise of capital provided (either directly or through other related enterprises) by a foreign direct investors to an FDI enterprise. FDI inflows include the three following components: equity capital, reinvested earnings and intra-company loans and are recorded on net basis (capital transactions credits less debits between direct investors and their foreign affiliates).[6] Net decreases in assets or net increases in liabilities are recorded as credits (with a positive sign), while net increases in assets or net decreases in liabilities are recorded as debits (with a negative sign). Hence, FDI inflows with a negative sign indicate that at least one of the three components of FDI is negative and not offset by positive amounts of the remaining components. These are called reverse investment or disinvestment. Further we transformed the FDI inflows variable into a real variable by deflating it with the import price index of each country.

[4] $\theta(Z)$ is an exogenous function of Z.

[5] Equivalently, in Feder's (1982) model equation (12) would become $\frac{\dot{Y}}{Y} = \alpha\frac{\dot{K}}{K} + \beta\frac{\dot{L}}{L} + \gamma(\frac{\dot{X}}{Y}) + \theta\frac{\dot{X}}{X}$.

[6] Equity capital is the foreign direct investor's purchase of shares of an enterprise in a country other than that of its residence. Reinvested earnings consist of direct investor's share (in proportion to direct equity participation) of earnings not distributed as dividends by affiliates or earnings not remitted to the direct investor. Such retained profits by affiliates are reinvested. Intra-company loans or intra-company debt transactions refer to short- or long-term borrowing and lending of funds between direct investors (parent enterprises) and affiliate enterprises.

The data for all other variables (real GDP, real gross domestic capital formation, real exports, population, and import price index) are obtained from the World Development Indicators (WDI) of the World Bank.

The time period we cover in this study is from 1970 to 2001. Like most of the cross-country empirical growth studies we consider five-year period averages in order to avoid the cyclical factors which are hard to control in annual data (see for example Durlauf et al., 2008; Henderson et al., 2009; Maasoumi, Racine, and Stengos, 2007). In our sample we include a wide range of developing countries however the selection of countries is based on the availability of the data especially with regards to the FDI variable.

5.2. Linear estimation results

We begin our empirical analysis by estimating the basic model assuming a linear specification) using ordinary least squares in order to test the presence of dualistic growth in our sample of countries. The results are reported in Table 1 column (1) and they provide support to Feder's (1982) initial hypothesis that the marginal factor productivity are higher in the export sector than the non-exports sector, as the coefficient of the term $(\dot{X}/Y)$ is positive and significant. These results provide an indication of the presence of a dualistic growth framework in our sample of courtiers.

We then proceed to estimate the second reduced form equation of the basic (linear) model by specifying the sector externality effect separately. The results reported in Table 1 column (2) indicate that the inter-sector externality parameter (θ) is statistically significant and positive suggesting the presence of spillover effects from the exports to the non-exports sector. Also the magnitude of the estimated parameter is quite substantial, which is consistent with Feder (1982). From a first glance at these results we see that there is a difference between the two specifications (columns (1) and (2)), something that suggests that the simple formulation of column (1) is misspecified.[7]

Next we estimate our extended Feder model (after augmenting the foreign investment variable) as given in equation (9) using ordinary least squares and the results are reported in Table 2 column (1). As can be seen, the foreign investment variable is statistically significant and has positive sign confirming the role of FDI as an important determinant of economic growth in developing countries. Also the magnitude of the estimated coefficient is quite substantial which confirms our hypothesis of the higher marginal productivity of foreign investment than domestic investment $(G_K^f/G_K^d = \lambda > 1)$. Before moving to the semi-parametric smooth coefficient estimation of equation (12) we first estimate it by using ordinary least squares in order to get some benchmark results. In order to do that, we assume that the sector-externality parameter (θ) is constant like in the basic Feder model. The results are reported in column (2) of Table 2. We can see that all the variables are significant at least at the 10 percent significance level. The FDI variable is highly significant and the magnitude of its coefficient is substantially increased, thus providing some indication of the presence of indirect impact of FDI on economic growth through spillover effects. It is worth noting that after specifying the sectorial externality effect separately most coeffciients change magnitude and significance level, an indication that the previous linear formulations may have been misspecified. We are able to verify this observation by analyzing the smooth coefficient estimation results of the extended model, equation (12), in the next section.

5.3. Smooth coefficient semi-parametric estimation results

The semi-parametric estimation results of the linear part of the model presented in equation (12) are reported in column

Table 1
OLS estimation of Feder's Dualistic growth model (*Dependent variable: real GDP growth*).

	Five-year averages		Ten-year averages	
	(1)	(2)	(1)	(2)
Gross domestic capital formation(growth)	0.16*	0.15*	0.12	0.08
	(0.03)	(0.03)	(0.07)	(0.07)
Population growth	0.21	0.30	1.24*	1.39*
	(0.18)	(0.19)	(0.38)	(0.43)
Exports growth × Exports/GDP	0.46*	0.22*	0.79*	0.64*
	(0.07)	(0.09)	(0.17)	(0.21)
Exports growth	–	0.12*	–	0.16
		(0.04)		(0.13)
Adjusted R^2	0.53	0.56	0.80	0.80

Note: values in ( ) are the standard errors. "*", "**" and "***" represents the 1%, 5% and 10% significance levels, respectively.

Table 2
Estimation results for extended Feder model (*Dependent variable: real GDP growth*).

	OLS		Semi-parametric
	(1)	(2)	(3)
Gross domestic capital formation(growth)	0.15*	0.15*	0.15*
	(0.03)	(0.03)	(0.01)
Population growth	0.20	0.30***	0.33**
	(0.18)	(0.18)	(0.14)
FDI/GDP (Change)	0.19**	0.24*	0.19**
	(0.11)	(0.10)	(0.09)
Exports growth × Exports/GDP	0.42*	0.16**	–
	(0.07)	(0.09)	
Exports growth	–	0.13*	–
		(0.04)	
Adjusted R^2	0.55	0.56	0.61[a]

Note: values in ( ) are the standard errors. "*", "**" and "***" represents the 1%, 5% and 10% significance levels, respectively.
[a] for semi-parametric model the reported R^2 is the unadjusted R^2.

[7] We repeated the same exercise by using 10-year period averages and the results gave a similar pattern and are not reported.

(3) of Table 2. The fit of the semiparametric model has increased and the estimate of the linear part of the model for the FDI effect is still significant as in the linear specifications. However, interestingly enough the effect is now smaller and resembles the linear specification without the sectoral externality. This is not the case for the estimated of the population growth variable that is closer to the estimate of the linear version of equation (12). A test of the null hypothesis of a linear specification against the smooth coefficient semiparametric alternative clearly rejects the former. Fig. 1 plots the point—wise estimate of the productivity differential between exports and non-exports sector on the vertical axis and the per capita FDI inflows on the horizontal axis. Inspection of Fig. 1 shows that the gains in the growth rate of GDP due to the reallocation of resources from non-exports to exports sector are highly non-linear. The contribution of exports to growth due to higher factor productivity is increasing with FDI inflows. For example in the range between 0.002 and 60 dollars per capita FDI inflows, this coefficient is increasing and achieves its maximum where the per capita FDI inflows are around 62 dollars. These results confirm that the contribution of exports to economic growth is not uniform across countries. The average productivity differentials for each country along with the standard errors are reported in Table 3 column (1). The average productivity differential ranges between 0.18 for Bangladesh to 0.71 for Malaysia, where average FDI inflows ranges between 0.25 dollars per capita for Bangladesh and around 100 dollars for Malaysia. Most of the economies that lie in the higher productivity range are the economies that see their economic growth as being "export-led". These are the economies that consider the "EPFDI" as a part of their economic development strategies.

In Fig. 2 we plot the point—wise estimate of the intersectional externality parameter on y-axis and the FDI inflows on x-axis. By examining Fig. 2 we can observe that the magnitude of the external effect of exports to non-exports sector is initially decreasing with the increase in FDI inflows. Moreover, these spillover effects are increasing when FDI inflows are above a certain threshold level. The average spillover effects from the exports to the non-exports sector for each country along with the standard errors are reported in Table 3 column (2). By looking at Table 3 we can see that the average

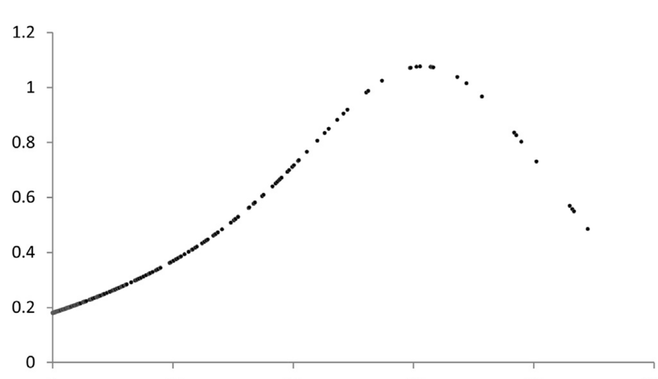

Fig. 1. Marginal productivity differential in exports sector as a function of FDI.

Table 3
The estimated productivity differential and externality parameter by country.

Country	Productivity differential parameter	Inter-sectoral externality parameter
Algeria	0.275	0.158
(DZA)	(0.095)	(0.016)
Argentina	0.499	0.084
(ARG)	(0.228)	(0.149)
Bangladesh	0.182	0.174
(BGD)	(0.003)	(0.001)
Benin	0.221	0.167
(BEN)	(0.040)	(0.007)
Bolivia	0.297	0.161
(BOL)	(0.127)	(0.006)
Botswana	0.874	0.097
(BWA)	(0.233)	(0.012)
Brazil	0.318	0.137
(BRA)	(0.105)	(0.025)
Bulgaria	0.630	0.132
(BGR)	(0.579)	(0.049)
Burkina Faso	0.184	0.174
(BFA)	(0.002)	(0.000)
Cameroon	0.215	0.168
(CMR)	(0.014)	(0.003)
Chad	0.235	0.164
(TCD)	(0.057)	(0.010)
Chile	0.579	0.129
(CHL)	(0.315)	(0.028)
China	0.314	0.154
(CHN)	(0.174)	(0.025)
Costa Rica	0.549	0.118
(CRI)	(0.237)	(0.016)
Cote d'Ivoire	0.233	0.165
(CIV)	(0.055)	(0.009)
Dominican Republic	0.552	0.131
(DOM)	(0.268)	(0.026)
Ecuador	0.416	0.140
(ECU)	(0.226)	(0.028)
Egypt, Arab Rep.	0.439	0.135
(EGY)	(0.155)	(0.020)
El Salvador	0.343	0.153
(SLV)	(0.302)	(0.036)
Ethiopia	0.191	0.172
(ETH)	(0.013)	(0.002)
Gambia, The	0.273	0.159
(GMB)	(0.110)	(0.017)
Guatemala	0.384	0.142
(GTM)	(0.119)	(0.016)
Guinea	0.201	0.171
(GIN)	(0.002)	(0.000)
Honduras	0.412	0.139
(HND)	(0.180)	(0.022)
India	0.188	0.173
(IND)	(0.011)	(0.002)
Indonesia	0.220	0.167
(IDN)	(0.030)	(0.005)
Iran, Islamic Rep.	0.309	0.154
(IRN)	(0.135)	0.021
Kenya	0.192	0.172
(KEN)	(0.003)	(0.001)
Madagascar	0.194	0.172
(MDG)	(0.007)	(0.001)
Malawi	0.207	0.169
(MWI)	(0.031)	(0.006)
Malaysia	0.715	0.057
(MYS)	(0.188)	(0.093)

(continued on next page)

Table 3 (*continued*)

Country	Productivity differential parameter	Inter-sectoral externality parameter
Mali	0.192	0.172
(MLI)	(0.020)	(0.004)
Mauritius	0.413	0.142
(MUS)	(0.286)	(0.033)
Mexico	0.679	0.098
(MEX)	(0.276)	(0.031)
Morocco	0.215	0.168
(MAR)	(0.044)	(0.008)
Mozambique	0.203	0.170
(MOZ)	(0.037)	(0.007)
Nicaragua	0.304	0.156
(NIC)	(0.213)	(0.028)
Pakistan	0.195	0.172
(PAK)	(0.012)	(0.002)
Panama	0.442	0.038
(PAN)	(0.345)	(0.220)
Papua New Guinea	0.391	0.143
(PNG)	(0.144)	(0.024)
Paraguay	0.341	0.148
(PRY)	(0.129)	(0.019)
Peru	0.384	0.152
(PER)	(0.267)	(0.025)
Philippines	0.263	0.160
(PHL)	(0.072)	(0.012)
Poland	0.406	0.096
(POL)	(0.022)	(0.056)
Romania	0.475	0.134
(ROM)	(0.368)	(0.047)
Senegal	0.207	0.169
(SEN)	(0.019)	(0.004)
South Africa	0.526	0.132
(ZAF)	(0.393)	(0.044)
Sri Lanka	0.232	0.165
(LKA)	(0.029)	(0.005)
Sudan	0.202	0.170
(SDN)	(0.033)	(0.006)
Swaziland	0.873	0.105
(SWZ)	(0.335)	(0.027)
Tanzania	0.213	0.168
(TZA)	(0.041)	(0.008)
Thailand	0.478	0.139
(THA)	(0.339)	(0.030)
Togo	0.214	0.168
(TGO)	(0.021)	(0.004)
Tunisia	0.617	0.116
(TUN)	(0.235)	(0.026)
Turkey	0.285	0.156
(TUR)	(0.055)	(0.009)
Uganda	0.211	0.169
(UGA)	(0.029)	(0.005)
Uruguay	0.578	0.124
(URY)	(0.325)	(0.030)
Venezuela, RB	0.366	0.125
(VEN)	(0.190)	(0.055)
Zambia	0.220	0.167
(ZMB)	(0.023)	(0.004)
Zimbabwe	0.206	0.170
(ZWE)	(0.033)	(0.006)

Note: averages by country, standard errors are parentheses.

spillover effects of exports to non-exports sector range between 0.04 and 0.17 indicating that there is a large variation across countries something that a linear specification is unable to capture. Our results also provide some indication that the

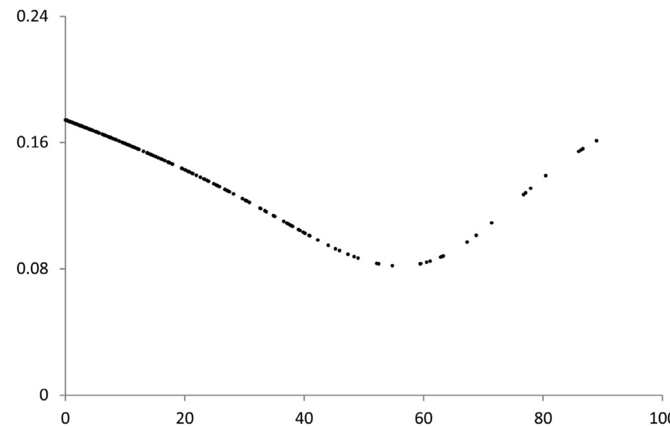

Fig. 2. Spillover over effects of exports to non-exports sector as a function of FDI.

nature of the spillover effects generated by the MNCs and their affiliates in the host economy are mostly vertical rather than horizontal in nature. In other words MNCs have incentive to minimize technology leakages to competitors while improving the productivity of suppliers by transferring knowledge to them. Recently, it has been argued that the productivity externalities from FDI are mainly taking place in upstream industries where local suppliers are in contact with MNCs. In fact, many studies for developing countries provide evidences for negative horizontal spillovers arising from MNCs activity, while confirming the presence of positive spillovers in upstream industries (see for example Blalock and Gertler, 2003; Javorcik, 2003). Our results also provide some indication of the presence spillover effects in the upstream industries. This is mainly due to the lack of interconnectivity between MNCs and local enterprises which is necessary for any spillover effects to occur in host countries. In this case, MNCs operate in enclaves thus limiting any benefits that can flow to local enterprises through their activities.

6. Conclusion

In this paper we study the role of FDI on the process of economic growth by extending the dualistic growth model developed by Feder (1982) and a smooth coefficient semiparametric approach. Using data from 60 developing countries from 1970 to 2001 we estimate the benchmark Feder model for five-year and ten-year period averages by using standard linear estimation techniques. Our benchmark results indicate the presence of a significant productivity differential between the exports and the non-exports sector of the country. Further, we also find the inter-sector externality parameter not only statistically significant but also substantial in the magnitude. In general, our results confirm that there are, on average, substantial differences in marginal productivity between the exports and non-exports sector and also that the exports sector confers positive effects on the productivity in other sectors through a sector-externality.

Next we moved to the smooth coefficient semi-parametric estimation of the extended model in order to show that both factor-productivity and sector-externality parameters are not constant across countries but depend on the FDI inflows. Our results show that there is a large variation in the factor-productivity and sector-externality estimates across countries. The countries with higher levels of FDI inflows have higher factor-productivity in the exports sector as compared with countries with low FDI inflows. Furthermore, the spillover effects from the exports to non-exports sector are decreasing among the countries with low levels of FDI inflows but increasing with the level of FDI when FDI inflows are above a certain threshold level (approximately 60 dollars per capita).

In summary, we can say that this research provides evidence supporting the view that export-oriented policies play an important role during the development process. Initially, by higher factor productivities of the exports sector, and subsequently by providing a platform for foreign investors to invest in highly productive exports-oriented industries. Finally, by generating spillover effects to the overall economy through the development of internationally competitive management, introduction of improved production techniques, investment in research and development, and the promotion of specialization in the production process are some of the channels discussed in the literature.

Appendix A.

Econometric Estimation: A Smooth Coefficient Semi-parametric Approach

A semiparametric varying coefficient model imposes no assumption on the functional form of the coefficients, and the coefficients are allowed to vary as smooth functions of other variables. Specifically, varying coefficient models are linear in the regressors but their coefficients are allowed to change smoothly with the value of other variables. One way of estimating the coefficient functions is by using a local least squares method with a kernel weight function. A semiparametric smooth coefficient model is given by:

$$y_i = \alpha(z_i) + w_i'\beta(z_i) + u_i \tag{A1}$$

where y_i denotes the dependent variable, w_i denotes a $p \times 1$ vector of variables of interest, z_i denotes a $q \times 1$ vector of other exogenous variables and $\beta(z_i)$ is a vector of unspecified smooth functions of z_i. To simplify the exposition, we ignore the partially linear nature of equations (12) and (13), by suppressing for now the vector of the v's. Based on Li et al. (2002), the above semiparametric model has the advantage that it allows more flexibility in functional form than a parametric linear model or a semiparametric partially linear specification. Furthermore, the sample size required to obtain a reliable semiparametric estimation is not as large as that required for estimating a fully nonparametric model. It should be noted that when the dimension of z_i is greater than one, this model also suffers from the "curse of dimensionality", although to a lesser extent than a purely nonparametric model where both z_i and w_i enter nonparametrically. Fan and Zhang (1999), suggest that the appeal of the varying coefficient model is that by allowing coefficients to depend on other variables, the modeling bias can significantly be reduced and the curse of dimensionality can be avoided. Equation (A1) above can be rewritten as

$$\begin{gathered} y_i = \alpha(z_i) + w_i^T\beta(z_i) + \varepsilon_i = \left(1, w_i^T\right)\begin{pmatrix}\alpha(z_i)\\ \beta(z_i)\end{pmatrix} + \varepsilon_i \\ y_i = W_i^T\delta(z_i) + \varepsilon_i \end{gathered} \tag{A2}$$

where $\delta(z_i) = \left(\alpha(z_i), \beta(z_i)^T\right)^T$ is a smooth but unknown function of z. One can estimate $\delta(z)$ using a local least squares approach, where

$$\hat{\delta}(z) = \left[(nh^q)^{-1}\sum_{j=1}^{n} W_j W_j^T K\left(\frac{z_j - z}{h}\right)\right]^{-1} \times \left\{(nh^q)^{-1}\sum_{j=1}^{n} W_j y_j K\left(\frac{z_j - z}{h}\right)\right\} = [D_n(z)]^{-1}A_n(z)$$

and $D_n(z) = (nh^q)^{-1}\sum_{j=1}^{n} W_j W_j^T K$, $A_n(z) = (nh^q)^{-1}\sum_{j=1}^{n} W_j y_j K$, $K = K\left(\frac{z_j - z}{h}\right)$ is a kernel function and $h = h_n$ is the smoothing parameter for sample size n. The intuition behind the above local least-squares estimator is straightforward. Let us assume that z is a scalar and $K(.)$ is a uniform kernel. In this case the expression for $\hat{\delta}(z)$ becomes

$$\hat{\delta}(z) = \left[\sum_{|z_j - z| \le h} W_j W_j^T\right]^{-1} \sum_{|z_j - z| \le h} W_j y_j$$

In this case $\hat{\delta}(z)$ is simply a least squares estimator obtained by regressing y_j on W_j using the observations of (W_j, y_j) that their corresponding z_j is close to z ($|z_j - z| \le h$). Since $\delta(z)$ is a smooth function of z, $|\delta(z_j) - \delta(z)|$ is small when $|z_j - z|$ is small. The condition that nh^q is large ensures that we have sufficient observations within the interval $|z_j - z| \le h$ when $\delta(z_j)$ is close to $\delta(z)$. Therefore, under the conditions that $h \to 0$ and $nh^q \to \infty$, one can show that the local least squares regression of y_j on X_j provides a consistent estimate of $\delta(z)$. In general it can be shown that

$$\sqrt{nh^q}\left(\hat{\delta}(z) - \delta(z)\right) \to N(0, \Psi)$$

where Ψ can be consistently estimated. The estimate of Ψ can be used to construct confidence bands for $\hat{\delta}(z)$. We use a standard multivariate kernel density estimator with Gaussian kernel and cross validation to choose the bandwidth.

An interesting special case of equation (A2), is when the v's from equation (13 are taken into account. In that case some of the coefficients in equation (A2) are constants (independent of z) In that case, equation (A2) can be rewritten as

$$y_i = V_i^T\alpha + W_i^T\delta(z_i) + \varepsilon_i \tag{A3}$$

where V_i is the $i-th$ observation on a $(q \times 1)$ vector of additional regressors that enter the regression function linearly (in our case where $V = \left\{\frac{\dot{K}}{K}, \frac{\dot{L}}{L}, \frac{K_X^f}{Y}\right\}$. The estimation of this model requires some special treatment as the partially linear structure may allow for efficiency gains, since the linear part can be estimated at a much faster rate, namely $\sqrt{n}$.

The partially linear model in equation (A3) has been studied by Zhang et al. (2002). Zhang and Felmingham (2002) suggest a two-step procedure where the coefficients of the linear part are estimated in the first step using polynomial fitting with an initial small bandwidth using cross validation. In other words the approach is based on undersmoothing in the first stage. Then these estimates are averaged to yield the final first step linear part estimates which are then used to redefine the dependent variable and return to the environment of equation (A1) where local smoothers can be applied as described above.

Linearity Test

We will present below a test statistic that was used by Li et al. (2002). In our implementation we will use a bootstrap version of this test. Let y_i denote the dependent variable, and let x_i be $p \times 1$ and z_i be $q \times 1$ vectors of exogenous variables. Consider the following linear model.

$$y_i = \alpha_0 + w_i^T \beta_0 + z_i^T \theta + \varepsilon_i \tag{A4}$$

which can be thought of as a special case of the smooth coefficient model of equation (A2) above

$$y_i = \alpha_0(z_i) + w_i^T \beta_0(z_i) + \varepsilon_i = \left(1, w_i^T\right) \begin{pmatrix} \alpha_0(z_i) \\ \beta_0(z_i) \end{pmatrix} + \varepsilon_i \tag{A5}$$

$$y_i = W_i^T \delta_0(z_i) + \varepsilon_i$$

where $\delta_0(z_i) = (\alpha_0(z_i), \beta_0(z_i)^T)^T$ is a smooth known function of z. For example in the context of equation (12), ignoring for the moment the presence of the v's, we have $\alpha_0(z_i) = \alpha + z_i^T \theta$ and $\beta_0(z_i) = \beta$. Similarly equation (A4) captures the case of the augmented version of (A1) to allow for the simple interactions of the w's with z, where $\alpha_0(z_i) = \alpha + z_i \theta$ and $\beta_0(z_i) = \beta_1 + \beta_2 z$.

We can test the adequacy of (A4), the H_0, against the semiparametric alternative (A5) using the following test statistic.

$$\widehat{I}_n = \frac{1}{n^2 h^q} \sum_i \sum_{j \neq i} W_i^T \left(y_i - W_i^T \widehat{\delta}_0(z_i)\right) W_j \left(y_j - W_j^T \widehat{\delta}_0(z_j)\right) K \times \left(\frac{z_j - z_i}{h}\right) = \frac{1}{n^2 h^q} \sum_i \sum_{j \neq i} W_i^T W_j \widehat{\varepsilon}_i \widehat{\varepsilon}_j K \left(\frac{z_j - z_i}{h}\right)$$

where $\widehat{\varepsilon}_i$ denotes the residual from parametric estimation (under H_0) It can be shown that under H_0, $J_n = nh^{q/2} \widehat{I}_n / \widehat{\sigma}_0 \rightarrow N(0,1)$, where $\widehat{\sigma}_0^2$ is a consistent estimator of the variance of , see Li et al. (2002). It can be shown that the test statistic is a consistent test for testing H_0 (equation (3)) against H_1 (equation (1)). We use a bootstrap version of the above test statistic, since bootstrapping improves the size performance of kernel based tests for functional form, see Zheng (1996) and Li and Wang (1998).

Appendix B.

Table B1
List of countries in the sample.

Country	Code	Region	Income group	Country	Code	Region	Income group
Algeria	DZA	Middle East & North Africa	Upper middle income	Malawi	MWI	Sub-Saharan Africa	Low income
Argentina	ARG	Latin America & Caribbean	Upper middle income	Malaysia	MYS	East Asia & Pacific	Upper middle income
Bangladesh	BGD	South Asia	Low income	Mali	MLI	Sub-Saharan Africa	Low income
Benin	BEN	Sub-Saharan Africa	Low income	Mauritius	MUS	Sub-Saharan Africa	Upper middle income
Bolivia	BOL	Latin America & Caribbean	Lower middle income	Mexico	MEX	Latin America & Caribbean	Upper middle income
Botswana	BWA	Sub-Saharan Africa	Upper middle income	Morocco	MAR	Middle East & North Africa	Lower middle income
Brazil	BRA	Latin America & Caribbean	Upper middle income	Mozambique	MOZ	Sub-Saharan Africa	Low income
Bulgaria	BGR	Europe & Central Asia	Upper middle income	Nicaragua	NIC	Latin America & Caribbean	Lower middle income
Burkina Faso	BFA	Sub-Saharan Africa	Low income	Pakistan	PAK	South Asia	Lower middle income
Cameroon	CMR	Sub-Saharan Africa	Lower middle income	Panama	PAN	Latin America & Caribbean	Upper middle income
Chad	TCD	Sub-Saharan Africa	Low income	Papua New Guinea	PNG	East Asia & Pacific	Lower middle income
Chile	CHL	Latin America & Caribbean	Upper middle income	Paraguay	PRY	Latin America & Caribbean	Lower middle income
China	CHN	East Asia & Pacific	Lower middle income	Peru	PER	Latin America & Caribbean	Upper middle income
Costa Rica	CRI	Latin America & Caribbean	Upper middle income	Philippines	PHL	East Asia & Pacific	Lower middle income
Côte d'Ivoire	CIV	Sub-Saharan Africa	Lower middle income	Poland	POL	Europe & Central Asia	Upper middle income
Dominican Republic	DOM	Latin America & Caribbean	Upper middle income	Romania	ROM	Europe & Central Asia	Upper middle income
Ecuador	ECU	Latin America & Caribbean	Lower middle income	Senegal	SEN	Sub-Saharan Africa	Low income
Egypt, Arab Rep.	EGY	Middle East & North Africa	Lower middle income	South Africa	ZAF	Sub-Saharan Africa	Upper middle income
El Salvador	SLV	Latin America & Caribbean	Lower middle income	Sri Lanka	LKA	South Asia	Lower middle income

Table B1 (*continued*)

Country	Code	Region	Income group	Country	Code	Region	Income group
Ethiopia	ETH	Sub-Saharan Africa	Low income	Sudan	SDN	Sub-Saharan Africa	Lower middle income
Gambia, The	GMB	Sub-Saharan Africa	Low income	Swaziland	SWZ	Sub-Saharan Africa	Lower middle income
Guatemala	GTM	Latin America & Caribbean	Lower middle income	Tanzania	TZA	Sub-Saharan Africa	Low income
Guinea	GIN	Sub-Saharan Africa	Low income	Thailand	THA	East Asia & Pacific	Lower middle income
Honduras	HND	Latin America & Caribbean	Lower middle income	Togo	TGO	Sub-Saharan Africa	Low income
India	IND	South Asia	Lower middle income	Tunisia	TUN	Middle East & North Africa	Lower middle income
Indonesia	IDN	East Asia & Pacific	Lower middle income	Turkey	TUR	Europe & Central Asia	Upper middle income
Iran, Islamic Rep.	IRN	Middle East & North Africa	Lower middle income	Uganda	UGA	Sub-Saharan Africa	Low income
Kenya	KEN	Sub-Saharan Africa	Low income	Uruguay	URY	Latin America & Caribbean	Upper middle income
Madagascar	MDG	Sub-Saharan Africa	Low income	Venezuela, RB	VEN	Latin America & Caribbean	Upper middle income
				Zambia	ZMB	Sub-Saharan Africa	Low income
				Zimbabwe	ZWE	Sub-Saharan Africa	Low income

Table B2
Data averages by country (1970–2001).

	Per capita	Growth (%)			
	FDI inflows	GDP	Domestic investment	Population	Exports
Algeria	10.24	3.57	3.97	2.70	2.26
Argentina	69.13	1.84	0.71	1.44	4.97
Bangladesh	0.25	3.97	7.43	2.25	8.64
Benin	5.00	3.73	−4.80	3.13	−0.02
Bolivia	21.23	2.37	2.58	2.28	3.35
Botswana	50.11	9.50	9.44	3.07	10.70
Brazil	40.12	2.99	1.17	1.94	7.42
Bulgaria	36.23	−1.98	−5.92	−0.97	−14.55
Burkina Faso	0.52	4.04	3.46	2.63	1.19
Cameroon	4.50	5.14	7.01	2.84	8.12
Chad	6.60	2.22	12.90	3.20	−1.24
Chile	96.06	4.63	5.46	1.57	8.45
China	12.64	9.32	6.17	1.27	8.16
Costa Rica	62.64	3.85	4.30	2.59	6.34
Cote d'Ivoire	6.34	2.07	−1.42	3.90	4.07
Dominican Republic	39.98	5.27	7.26	2.21	4.85
Ecuador	20.59	2.95	1.64	2.35	4.53
Egypt, Arab Rep.	23.80	5.78	5.27	2.30	5.92
El Salvador	12.36	1.56	2.97	1.40	2.96
Ethiopia	1.35	2.75	−0.09	3.09	2.61
Gambia, The	9.88	3.94	9.19	3.68	2.43
Guatemala	20.15	2.94	3.10	2.39	1.97
Guinea	2.67	4.07	−0.93	3.09	2.47
Honduras	21.41	3.58	4.10	2.81	2.05
India	0.98	5.36	6.03	1.98	7.72
Indonesia	5.06	5.54	6.62	1.72	3.67
Iran, Islamic Rep.	12.94	5.10	6.85	2.40	1.94
Kenya	1.57	3.11	1.70	3.34	3.62
Madagascar	1.82	2.01	5.20	2.94	4.14
Malawi	3.37	3.42	−2.08	3.21	3.28
Malaysia	94.84	6.63	9.25	2.54	9.15
Mali	1.54	2.02	3.49	1.91	7.61
Mauritius	19.26	4.60	4.33	1.16	6.50
Mexico	60.63	3.90	3.99	2.25	9.53
Morocco	4.28	3.94	4.45	2.15	5.58
Mozambique	2.84	2.25	4.46	2.02	2.73
Nicaragua	10.71	0.60	1.42	2.55	2.44
Pakistan	1.88	5.05	4.12	2.76	5.38
Panama	148.98	4.25	9.73	2.09	0.22
Papua New Guinea	36.68	2.96	0.98	2.47	7.57
Paraguay	16.10	4.50	5.56	2.57	7.02
Peru	22.05	2.22	2.97	2.30	3.33
Philippines	9.45	3.41	3.92	2.53	6.79
Poland	85.95	2.97	5.82	0.10	8.59
Romania	22.72	−1.91	1.12	−0.38	6.06
Senegal	3.44	2.57	4.48	2.90	2.04
South Africa	25.04	2.53	3.44	2.28	1.69
Sri Lanka	6.42	4.20	3.04	1.06	6.61
Sudan	2.71	4.46	3.08	2.96	7.24
Swaziland	53.53	6.02	3.71	2.92	6.46
Tanzania	4.15	3.33	0.23	2.99	9.10
Thailand	26.15	6.43	5.97	1.63	10.78
Togo	4.31	1.87	−2.42	3.14	1.02
Tunisia	33.59	4.56	4.29	2.16	5.89
Turkey	12.14	3.67	1.71	1.74	8.35
Uganda	3.89	6.33	6.02	3.26	10.81
Uruguay	31.66	2.10	2.97	0.60	5.63
Venezuela, RB	49.19	1.22	0.74	2.43	0.90
Zambia	5.10	1.19	−3.85	3.10	1.18
Zimbabwe	3.18	0.34	−2.74	2.32	3.54
Average	23.36	3.55	3.43	2.29	4.70
Std. Dev.	29.07	2.06	3.63	0.91	3.92

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